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DMS-100 Family

Device Independent Recording Package

Product Guide

BCS33 and up   Standard 01.03   March 1993

northern telecom

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Product Guide

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BCS33 Standard 01.03 Third release of this document.

- added automatic file transfer (AFT) information

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BCS33 Standard 01.02 Second release of this document.

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BCS33 Standard 01.01 First release of this document.

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About this document

This document provides a general overview of the device independent recording package (DIRP) utility and a guide to other DIRP Northern Telecom publications (NTP). The information in this document is intended for operating company personnel who are responsible for planning, engineering, administering, and maintaining the DIRP utility.

When to use this document

Northern Telecom (NT) software releases are referred to as batch change supplements (BCS) and are identified by a number, for example, BCS29. This document is written for DMS-100 Family offices that have BCS33 and up.

More than one version of this document may exist. The version and issue are indicated throughout the document, for example, 01.01. The first two digits increase by one each time the document content is changed to support new BCS-related developments. For example, the first release of a document is 01.01, and the next release of the document in a subsequent BCS is 02.01. The second two digits increase by one each time a document is revised and rereleased for the same BCS.

To determine which version of this document applies to the BCS in your office, check the release information in *DMS-100 Family Guide to Northern Telecom Publications*, 297-1001-001.

How to identify the software in your office

The *Office Feature Record (D190)* lists your current BCS and the NT feature packages in it. You can view similar information on a MAP (maintenance and administration position) terminal by typing

>PATCHER;INFORM LIST;LEAVE

and pressing the Enter key.

How DIRP documentation is organized

This document is part of DIRP documentation that supports the Northern Telecom DIRP utility. DIRP documentation is a subset of the DMS-100 Family library.

The DMS-100 Family library is structured in numbered layers, and each layer is associated with an NT product. To understand the DIRP utility, you need documents from the following layers:

- DMS-100 Family basic documents in the 297-1001 layer
- DIRP documents in the 297-1001 layer

DIRP documents and other documents that contain related information are listed in “Finding DIRP information” in this document.

References in this document

The following documents are referred to in this document.

Number	Title
297-1001-110	*Maintenance and Administration Position (MAP)*
297-1001-118	*Magnetic Tape Reference Manual*
297-1001-175	*Device Independent Recording Package Planning and Engineering Guide*
297-1001-311	*Distributed Processing Peripheral (DPP) User Guide*
297-1001-345	*Device Independent Recording Package Administration Guide*
297-1001-356	*Device Independent Recording Package Translations Guide*
297-1001-450	*Provisioning*
297-1001-451	*Common Customer Data Schema*
297-1001-455	*Office Parameters Reference Manual*
297-1001-509	*Command Reference Manual*
297-1001-510	*Log Report Manual*
297-1001-524	*Remote Data Polling System Description and Man-Machine Interface*
297-1001-526	*Disk Maintenance Subsystem Reference Manual*
297-1001-529	*Distributed Processing Peripheral Maintenance Reference Manual*
297-1001-571	*Device Independent Recording Package Alarm Clearing Procedures*
297-1001-572	*Device Independent Recording Package Routine Maintenance Procedures*
297-1001-573	*Device Independent Recording Package Trouble Locating and Clearing Procedures*
297-1001-574	*Device Independent Recording Package Recovery Procedures*
297-1001-801	*Feature Description Manual*
297-1001-805	*Hardware Description Circuit Cards Reference Manual*
297-1001-814	*Operational Measurements Reference Manual*
297-2001-350	*Meridian Digital Centrex (MDC) Translations Guide*
297-5001-504	*System Load Module Maintenance Performance Oriented Practice*
297-5001-523	*System Load Module Maintenance Reference Manual*

What precautionary messages mean

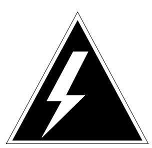
Danger, warning, and caution messages in this document indicate potential risks. These messages and their meanings are listed in the following chart.

Message	Significance
DANGER	Possibility of personal injury
WARNING	Possibility of equipment damage
CAUTION	Possibility of service interruption or degradation

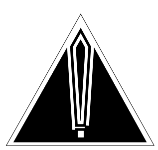
Examples of the precautionary messages follow.



DANGER
Risk of electrocution
The inverter contains high voltage lines. Do not open the front panel of the inverter unless fuses F1, F2, and F3 have been removed first. Until these fuses are removed, the high voltage lines inside the inverter are active, and you risk being electrocuted.



WARNING
Damage to backplane connector pins
Use light thumb pressure to align the card with the connectors. Next, use the levers to seat the card into the connectors. Failure to align the card first may result in bending of the backplane connector pins.



CAUTION
Loss of service
Subscriber service is lost if you remove a card from the active unit of the peripheral module (PM). Before continuing, confirm that you are removing the card from the inactive unit of the PM.

Understanding the DIRP utility

This chapter provides an overview of the DIRP utility. Topics covered in this chapter include the following:

- the DIRP utility
- organization of recorded subsystem data
- recording subsystem data
- audits
- transmitting automatic message accounting (AMA) data
- control tables
- DIRP101 log reports

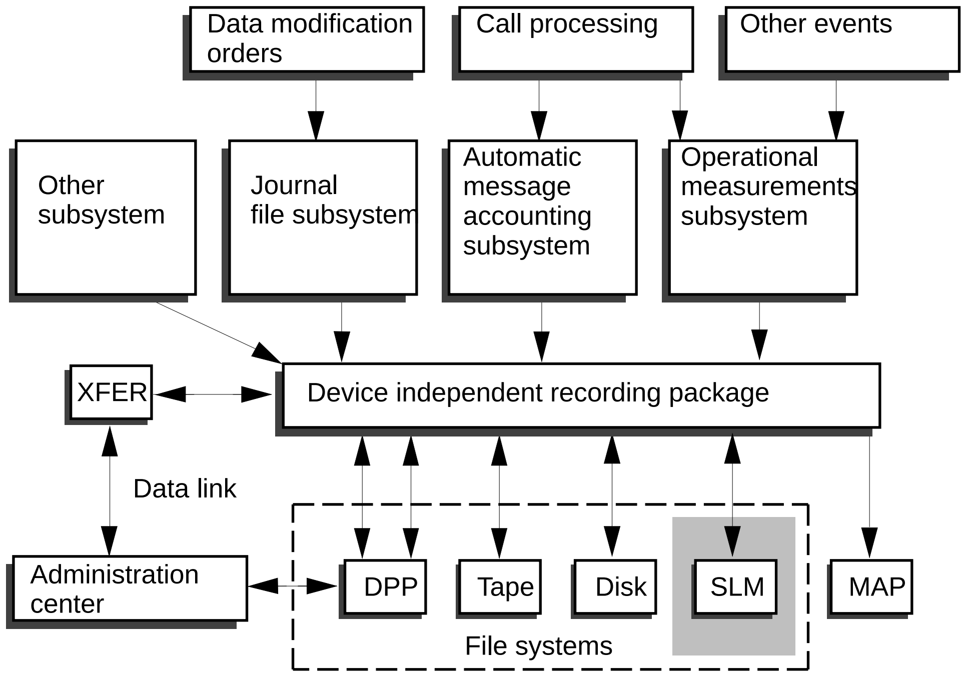
The DIRP utility

The device independent recording package is a utility that manages the reading and writing of data between various DMS subsystems and recording devices. The DIRP utility is part of the Common Basic feature package, NTX001AA, which is the basic operating software for all DMS-100 Family switches.

Two other software feature packages provide the DIRP utility with added capabilities:

- **NTX243AA** (Automatic Message Accounting Teleprocessing System (AMATPS)), allows the DIRP utility to process automatically subscriber billing data in Bellcore billing format
- **NTXJ44AA** (SLM File System) allows the DIRP utility to record to SLM disk drives. This feature applies only to DMS SuperNode switches.

Figure 1-1xxx
The DIRP utility



Note 1: The DPP emulates two tape drives in the DIRP environment.
Note 2: The SLM is part of the feature package NTXJ44AA, which is available on DMS SuperNode.

As shown in figure 1-1, typical DMS subsystem data recording managed by the DIRP utility includes

- automatic message accounting (AMA)
- journal file (JF)
- operational measurements (OM)
- remote data polling (XFER)

The AMA subsystem records billing data for subscriber-dialed long distance telephone calls. The JF subsystem provides a means of recording changes made to DMS data tables, and of subsequently restoring that data should the original be lost because of switch failure. The OM subsystem organizes measurement data and its transfer to displays and records on which maintenance, traffic, accounting, and provisioning decisions are based. The XFER subsystem transfers data to off-site processing centers. Subsystems that use the DIRP utility for recording data are called contributing subsystems.

Currently, the DIRP utility supports four recording device types:

- TAPE
- TAPEX
- DPP
- DISK

The device types TAPE and TAPEX are magnetic tape drives that have different file capabilities. The DPP is a disk drive unit (DDU) that emulates two magnetic tape drives. The device type DISK is an input/output controller (IOC) DDU. When the DIRP utility is configured with the feature package SLM File System, NTXJ44AA, the DIRP utility supports the recording of DMS subsystem data to the SLM disk drive.

Organization of recorded subsystem data

As figure 1-2 illustrates, the DIRP utility organizes recorded DMS subsystem data into the following groups:

- pools
- volumes
- files
- records

Pools

A pool is a group of up to 24 volumes. Each contributing DMS subsystem is allocated one or more pools; subsystems do not share pools. DIRP pools are identified by a pool number (pool_no) and a pool name (pool_name).

> ***Note:*** Do not confuse DIRP pools with support operating system (SOS) pools.

Volumes

A volume is either a portion of the recording space on a DDU, as figure 1-2 illustrates, or the entire recording space of a magnetic tape drive. A volume may contain one large file, such as the AMA records for a day, or several smaller files. DIRP volumes are identified by a volume number (vol_no) and volume name (vol_name).

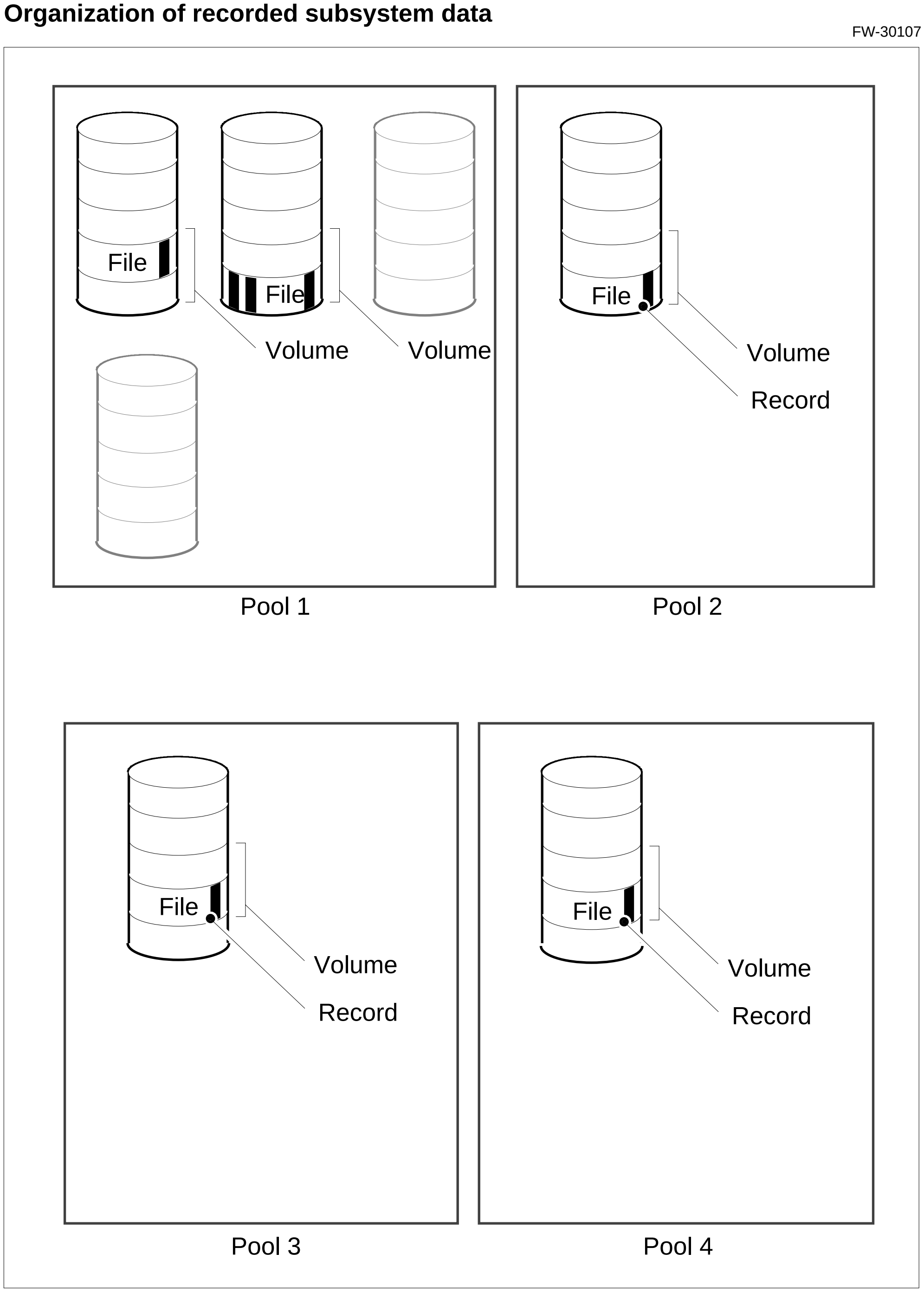
Files

A file is zero or more records. DIRP files are identified by a file name (file_name). File names can be generated by the user or the DIRP utility. Files generated by the DIRP utility are called file segments (FILESEGS).

Records

A record is the basic unit of data. DIRP records are measured in bytes and vary in size between 4 bytes and 2048 bytes, or two disk sectors. DIRP records are identified by a record number (record_no).

Figure 1-2xxx
Organization of recorded subsystem data



Recording subsystem data

The DIRP utility manages two types of recording processes for recording contributing DMS subsystem data:

- regular
- parallel

The regular recording process records the primary copy of contributing DMS subsystem data. The parallel recording process stores a secondary, or backup, copy of contributing DMS subsystem data for use if problems occur in the regular recording process.

Regular recording

As figure 1-3 illustrates, the DIRP utility maintains a lineup of files that are ready to record contributing DMS subsystem data.

There are two types of files in the lineup:

- active
- standby

The active file is the file to which the DIRP utility writes. Standby files are files that are awaiting their turn to take over the recording duties from the active file. A lineup has one active file and up to three standby files.

Once the active file is either closed or sent to the bottom of the lineup, the next file in the lineup, Standby 1, becomes the active file. The process of removing the active files from the head of lineup and moving the standby files into their place is called rotation.

File allocation scheme

The DIRP utility allocates files to the lineup of active or standby files from locations as far away from each other as possible to ensure the security of the recorded data.

The file allocation scheme is ordered as follows:

1 alternate IOC or SLM
2 alternate volume
3 same volume

As figure 1-4 illustrates, the DIRP utility first attempts to allocate files to the lineup from alternate IOCs or SLMs. If files on alternate IOCs or SLMs are unavailable, the DIRP utility attempts to allocate files to the lineup from alternate volumes that are on the same recording device. If the DIRP utility cannot find an alternate volume, the DIRP utility allocates files to the lineup from the same volume.

Figure 1-3xxx
Regular file rotation

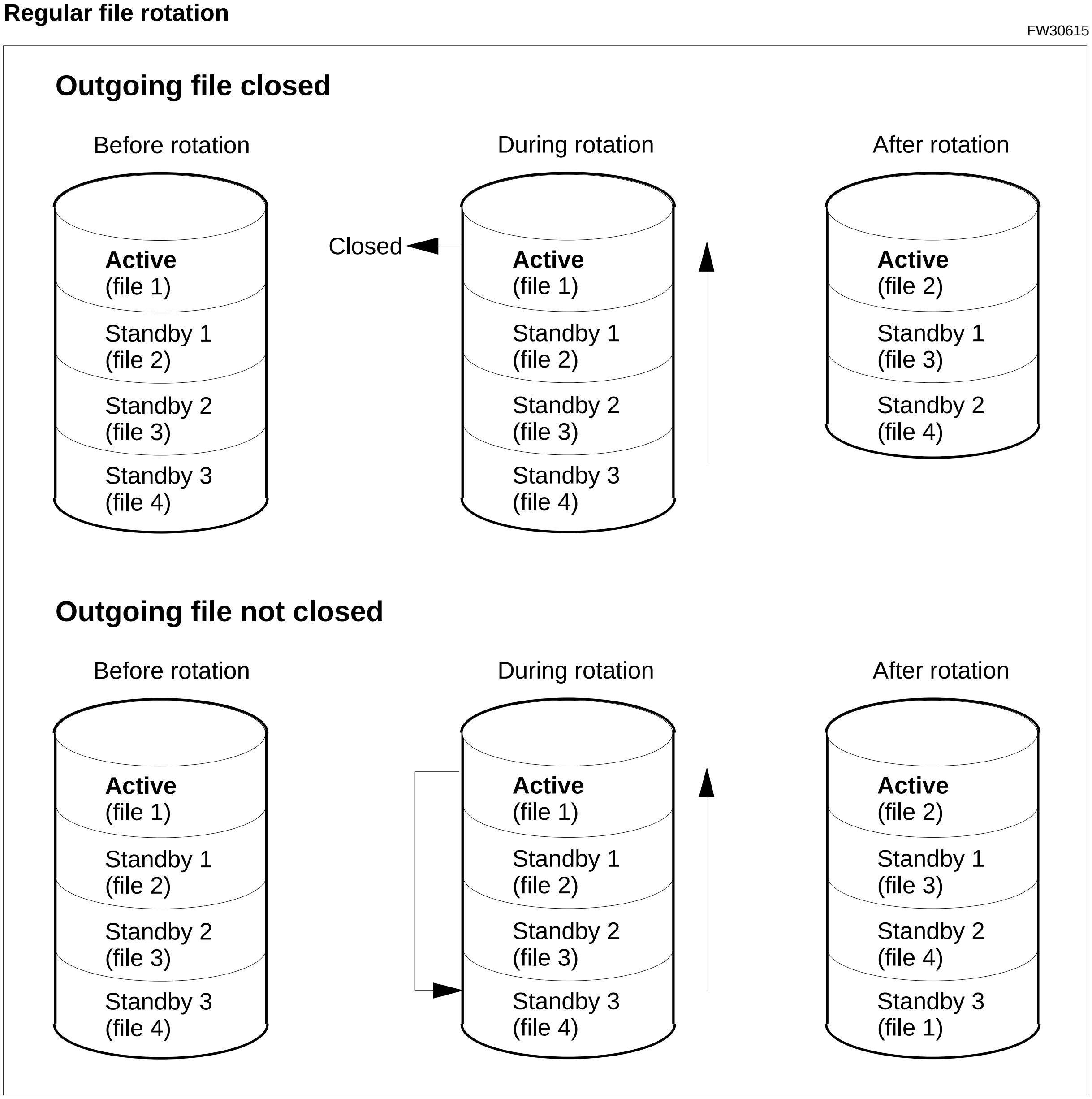
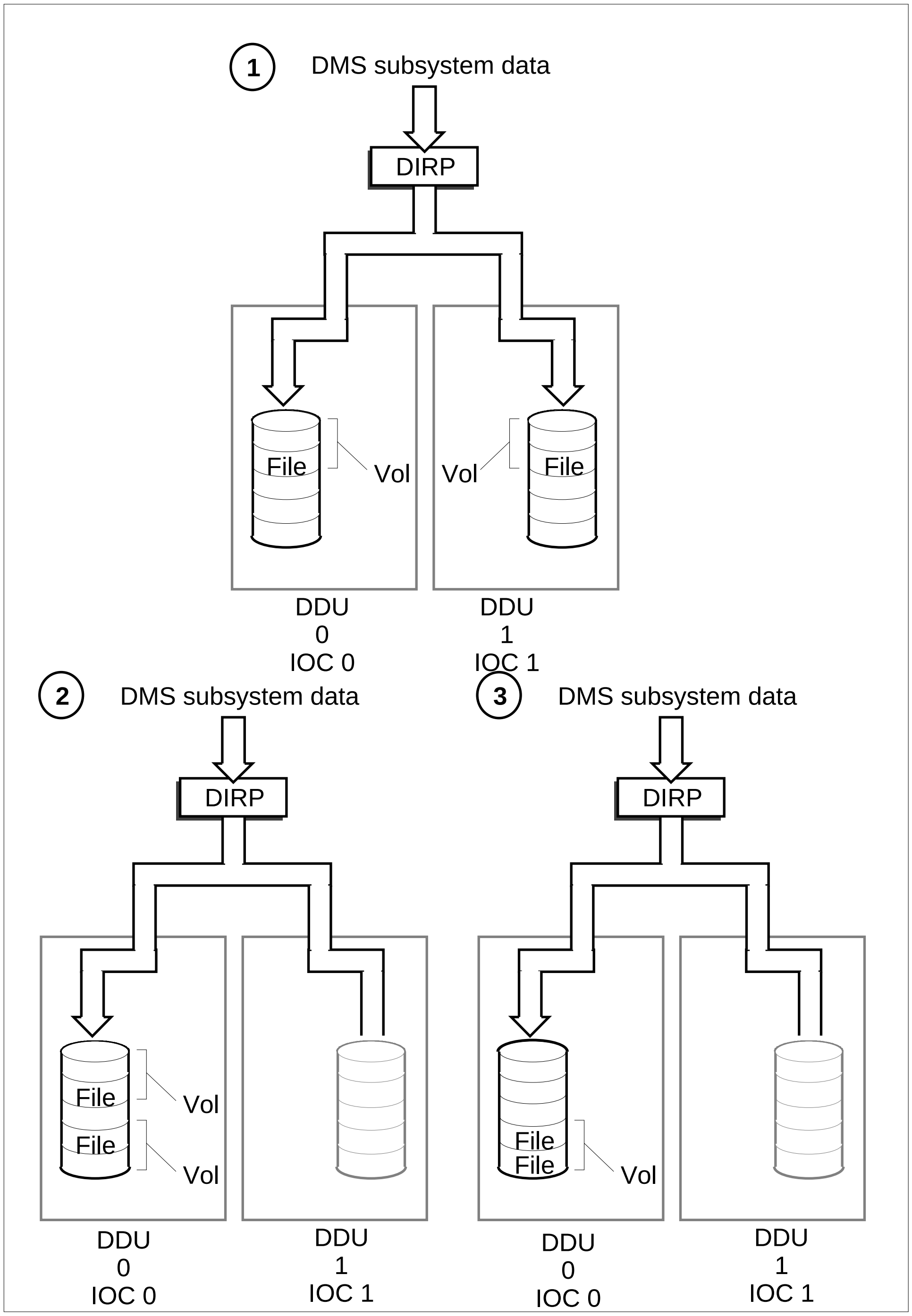


Figure 1-4xxx
File allocation scheme



Regular file rotation types

There are six types of regular file rotation:

- manual
- scheduled
- subsystem
- special
- space
- emergency

Manual rotation Manual rotation is initiated by operating company personnel using the ROTATE command.

Scheduled rotation Scheduled rotation is initiated by datafill in the DIRPSSYS table.

Subsystem rotation Subsystem rotation is used by the killer trunk (KTRK) subsystem. The KTRK subsystem rotates and closes its files at different times from those on the scheduled rotation.

Special rotation Special rotations are initiated by a DMS-250 feature in which a billing system audit determines whether the lack of recording space on an active disk volume necessitates a rotation to a standby volume that has more space. Special rotation has been largely superseded by space rotation in most offices.

Space rotation Space rotation manages the recording of files to disk. This feature is controlled by the SPACROTE and MAXDFSIZ fields in the DIRPSSYS table. Space rotation reduces the number of emergency rotations.

More detailed descriptions of space rotation and of datafilling table DIRPSSYS are contained in the *Device Independent Recording Package Translations Guide*, 297-1001-356.

Emergency rotation Emergency rotation occurs when the DIRP utility detects input/output errors or determines that the active file has used all the free recording space on a volume. The DIRP utility performs an emergency rotation to remove the faulty volume from the affected subsystem, then marks the faulty volume as INERROR. Marking the volume as INERROR minimizes the loss of critical data, such as AMA, by freezing the data on the faulty volume and preventing the volume from being used until the volume is recovered manually using the RSETVOL command. This feature of the the DIRP utility is critical to the protection of operating company revenue in cases of recording device failures.

Recovery of regular data

During a cold or warm restart, the DIRP restart audit attempts to reopen the files on the volumes and return the volumes to the READY state. The DIRP utility marks its volumes as RECOVERING during the restart audit. If any IOC disk or SLM volume is still in the RECOVERING state 5 min after the restart when the DIRP restart audit is run, the RECOVERING volume(s) is marked INERROR.

In pre-BCS31 offices, the RECOVERING state is used only during a warm or cold restart. The DIRP utility demounts all volumes during a restart reload. From BCS31 and up, the RECOVERING state is used not only for cold and warm restarts, but also for recovering IOC disk and SLM volumes that change from an in-service to an out-of-service state.

A complete description of the recovery of regular volumes is contained in *Device Independent Recording Package Recovery Procedures,* 297-1001-574.

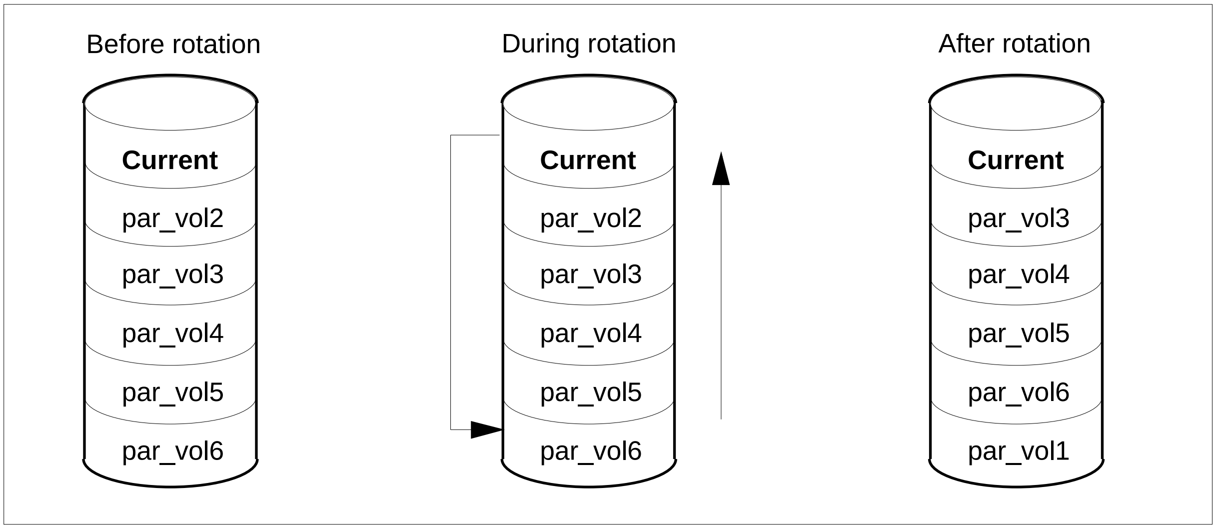
Parallel recording

Parallel recording maintains a secondary, or backup, copy of contributing DMS subsystem data. Parallel recording is initiated by datafill in the PARLPOOL field of the DIRPSSYS table.

The parallel recording process, as figure 1-5 illustrates, rotates parallel volumes in a continuous circle. Unlike regular volumes, which contain active and standby files, parallel volumes contain only one file. The parallel file to which the DIRP utility writes is called the current parallel file.

Figure 1-5xxx
Parallel file rotation

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Parallel rotation types

There are five types of parallel rotations:

- start-up
- manual
- synchronized
- automatic
- emergency

Start-up rotation Start-up rotation initiates parallel recording.

Manual rotation Manual rotation is initiated by operating company personnel by using the ROTATE command or by demounting the current parallel volume.

Synchronized rotation Synchronized rotation is initiated manually by operating company personnel by using the ROTATE command and the BOTH option. Unlike manual rotation, which rotates one file at a time, synchronized rotation rotates the regular and parallel files at the same time.

Automatic rotation Automatic rotation occurs when the current parallel file is full or when errors occur while the DIRP utility is writing to the file. After an automatic rotation, the next parallel file in the lineup becomes the current parallel file.

Emergency rotation Emergency rotation is initiated by the DIRP utility when it detects errors in the current parallel file.

Mandatory parallel recording

In pre-BCS31 offices, when a parallel volume is mounted and a fault occurs in the parallel file, the DIRP utility raises a minor ssys P alarm. For BCS31 and up, if no parallel volume is mounted, the DIRP utility raises no alarm to indicate that parallel recording is not occurring. In critical DIRP subsystems, such as AMA, the alarm level consists of a minor alarm for the loss of parallel recording and no alarm to indicate that a parallel volume is not mounted. This may be insufficient. To provide a sufficient level of alarm for the DIRP parallel recording, purchase feature package NTXJ94AA, Mandatory DIRP Parallel Recording, introduced in BCS31.

Feature package NTXJ94AA allows operating companies to assign an alarm level of their choice to the parallel recording volumes of a DIRP subsystem. The parallel alarm is controlled through the MANDPALM field in the DIRPSSYS table. If feature package NTXJ94AA is not installed, the MANDPALM field defaults to NA and cannot be changed by the operating company during datafill. Once an alarm level is assigned to the MANDPALM field, the alarm level cannot be changed to a lower alarm

level without assistance from the personnel responsible for the next level of support; however, the alarm can be changed to a higher level.

Recovery of parallel volumes

The DIRP utility automatically recovers parallel volumes in a parallel pool after a warm or cold restart. Parallel recording resumes on the same volume that was being written to before the restart. Recording continues on the next sequential block on the parallel file. After restart reloads, the DIRP utility automatically attempts to recover disk volumes that were allocated for parallel recording before the reload.

The DIRP utility attempts to recover all datafilled volumes after a system boot, which is followed by a restart reload. Volumes are recovered if they contain a valid parallel file and if they reside on a valid device.

On reloads only, either after all volumes have recovered or after 5 min, whichever comes first, the DIRP utility chooses the optimal volume to write to. This optimal volume is the one that contains the oldest parallel file. If a parallel volume that contains an unused parallel file recovers within 5 min of the reload, it is immediately picked up as the optimal volume. If a parallel volume recovers, but has a parallel file that has been opened for recording within the past 24 h, it is immediately demounted.

The recovery of parallel recording to tape requires manual intervention after restart reloads.

A complete description of the recovery of parallel volumes is contained in *Device Independent Recording Package Recovery Procedures*, 297-1001-574.

CAUTION
AMA subsystem may not be mounted
The AMA subsystem may not be mounted after a restart reload or an activity switch of the DMS-100 central control when the central controls are out of sync. Immediately after a restart reload, check the AMA volumes and ensure that they are mounted.

Audits

The DIRP utility performs audits on itself and on its recording devices to ensure that sufficient recording space is available, that available space is being used efficiently, and that the recording devices are operating properly.

The types of DIRP utility audits are:

- FILESYS device
- DIRP device
- subsystem

FILESYS device audits

FILESYS device audits verify that the DIRP utility recording devices are communicating with the DMS-100 central control, and test the condition of each recording device.

The FILESYS device audit is performed in the following instances:

- every 5 min to ensure that all recording devices are communicating with the DMS-100 central control
- whenever a new subsystem is added to the DIRP utility to ensure that recording devices are available to support the new subsystem
- whenever recording files are reopened to ensure that data can be recorded on the reopened file
- whenever tuples are added or changed in table DIRPPOOL to ensure that the volumes in a recording pool are not system-busy
- during a restart for all recording volumes that are marked RECOVERING to ensure that they recover

DIRP device audits

DIRP device audits automatically update the alarm indicators and verify that all recording devices are ready to receive data.

DIRP device audits include demand DIRP device audits and scheduled DIRP device audits.

Demand DIRP device audits

Demand DIRP device audits run on an unscheduled basis in the following instances:

- when the RSETVOL command is used to reset an INERROR volume to READY
- when the CLEANUP command is used to rename closed files on the disk volume to make recording space available
- when the number of file segments on a disk volume is low as a result of opening and extending files

- when a restart has occurred
- when a volume on the device is removed from use
- when changes to tables DIRPSSYS and DIRPPOOL affect the volumes on the DDU
- when files are opened, closed, or rotated
- when a parallel file on tape needs to be rewound

Demand DIRP device audits include demand disk audits and demand tape audits.

A demand disk audit performs the following tasks:

- attempts to recover disk volumes 5 min after a restart. Any volumes that cannot be recovered within 5 min of the restart are marked as unavailable.
- scans the files for existing files and puts all the files named DIRP_FILESEG in the FILESEGS table if any volumes are newly mounted in table DIRPPOOL or reallocated after a restart reload
- verifies that DMS subsystem data is being written to the active file. If not, the DIRP utility operates as if the volume recording this data was open before a restart reload and was replaced with another volume after the restart. The volume is then set to the OLDOPEN status so that it can be closed.
- verifies that all unprocessed files are listed in table DIRPHOLD, adding the file identification (ID) of any file not listed. The DIRP utility also ensures that the file name listed in table DIRPHOLD is the same as the actual file name.
- adds expired processed files to the list of expired files
- removes all TO_BE_DELETED active, standby, and parallel volumes if there are no open files on them
- erases processed files, beginning with the oldest, and creates file segments until each volume has at least four
- posts or clears alarms that warn of insufficient recording space
- closes recovered active files

A demand tape audit performs the following tasks:

- recovers tape volumes that were mounted before the restart and that are in the RECOVERING state

- checks for free tape-recording space if any subsystem needs more. If a READY volume that has free recording space is in the pool, the DIRP utility audits the subsystem using the pool to let the subsystem know that a volume is available. If any READY volumes that have no recording space available are found, the DIRP utility makes a list of these volumes by expiration date, then, starting with the oldest file and proceeding to the newest, tries to make at least one file available.
- demounts TO_BE_DELETED volumes that are not in use by any subsystem
- demounts any parallel volumes marked TO_BE_DELETED
- rewinds all parallel files on tape that are in need of rewinding

Scheduled daily disk audit

The scheduled daily disk audit runs every day at 03:11 A.M. It also runs on an unscheduled basis in response to the DIRPDAUD command.

The daily disk audit performs the following tasks:

- verifies that DMS subsystem is being written to the active file. If not, the DIRP utility operates as if this file was open before a restart reload and was replaced with another file after the restart. The DIRP utility marks the file so that the demand disk audit can close it.
- verifies that all unprocessed files are listed in table DIRPHOLD, adding the file ID of any file not listed
- ensures that the file name in table DIRPHOLD is the same as the actual file name
- checks the expiration date of processed files
- maintains an account of the number of file segments on each volume and the ID of each file segment
- initiates a demand disk audit

Subsystem audits

A subsystem audit performs the following tasks:

- verifies that all files required by the DIRP utility subsystem are open, and opens or reopens the files when necessary
- verifies that volume and file assignments are consistent and are properly distributed
- invokes the DIRP utility device audits on active, standby, and parallel volumes

Subsystem audits include hourly subsystem audits and unscheduled subsystem audits.

The hourly subsystem audit runs once an hour.

The unscheduled subsystem audit runs when

- new volumes are allocated to a subsystem's pool
- a subsystem's volume is recovering after a system restart
- data in tables DIRPPOOL, DIRPSSYS, and DIRPHOLD are changed
- the RSETVOL command is used to reset a subsystem's INERROR disk volumes

The hourly and unscheduled subsystem audits perform the following tasks:

- open a parallel file if parallel recording is required for the subsystem
- attempt to reopen the regular and parallel files that were open before the restart. This task is done only during warm and cold restarts. If the files cannot be reopened, the files are marked INERROR. If the files can be reopened, the files are prepared for recording.
- open new files on alternating IOCs until either the NUMFILES field in the DIRPSSYS table is satisfied, or until no more room is left in the subsystem recording pool if the number of files in a subsystem does not satisfy the NUMFILES field
- close as many files as possible that are on TO_BE_DELETED volumes until all files are closed, or until the MINFILES field defined in table DIRPSSYS is satisfied
- verify that the subsystem has enough files and that the active and standby files are on different IOCs
- initiate DIRP device audits

Transmitting AMA data

AMA data can be transferred to a central collection point, such as a host office collector, either manually or automatically.

Manual transfer

Manual transfer requires the copying of AMA files to tape from tape or disk, and physically transporting the tape to a central collection point, such as a host office collector, on a prearranged schedule.

Automatic transfer

There are two systems that automatically transfer AMA files over a data link:

- XFER
- AMATPS
- AFT

The basic automatic AMA data transfer system includes an AMA transmitter (AMAT) and the software required to implement link-level protocol support on the data link to the host office collector.

Remote data polling

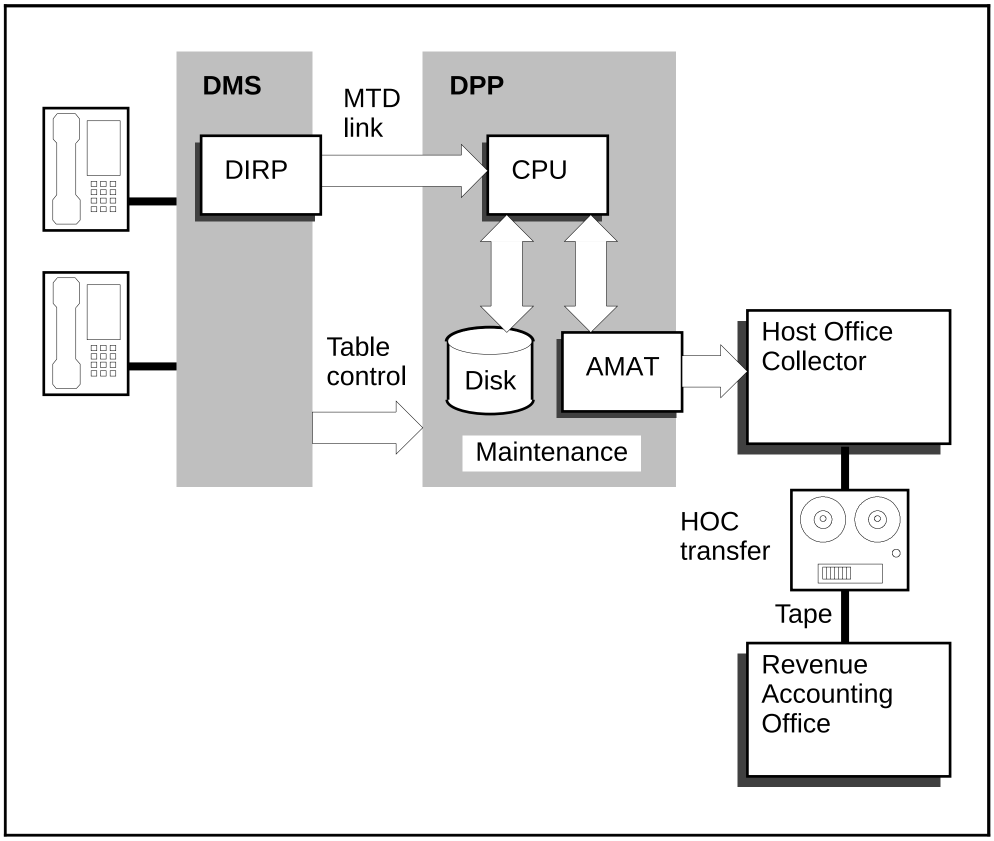
The XFER system consists of an AMA transmitter and controlling software. The AMA transmitter is the NT1X67 data packet controller, which is part of the NT1X89 multi-protocol controller. Feature package NTX059 provides the controlling software. In the XFER system, the host office collector contacts the AMA transmitter over a dedicated data link or the direct distance dialing network and requests the initiation of a polling session. Upon acknowledgement, the host office collector requests that certain AMA files be sent. Feature package NTX059 coordinates the AMA data transfer with the DIRP utility to the AMA transmitter, which implements the low-level communications protocol on the data link.

A complete description of the remote data polling system is contained in *Remote Data Polling System Description and Man-Machine Interface*, 297-1001-524.

Automatic message accounting teleprocessing system

The AMATPS system consists of the distributed processing peripheral (DPP) and feature package NTX243. The DPP is both the AMA transmitter and the recording device. The DPP is an intelligent peripheral of the DMS switch, with redundant processors and hard disk drives. In the DIRP environment, the DPP device emulates two magnetic tape drives (MTD), and duplicates all magnetic tape drive control signals and data exchanges. To initiate a polling session, the host office collector directly contacts the DPP device, which transfers the requested data to the host office collector. Unlike the XFER system, data transfer and file control in the AMATPS system are handled by the DPP device rather than by DMS central control.

Figure 1-6xxx
AMATPS system configuration



A more detailed description of the AMATPS system and its interaction with the DIRP utility is contained in *Device Independent Recording Package Translations Guide*, 297-1001-356.

Automatic file transfer

The AFT system consists of two NT1X86BA enhanced multi-protocol controller (EMPC) cards and the feature package AD3963. Once the system is activated, it obtains a directory of all unprocessed DIRP files. The system selects and opens files one at a time based on the order in which they were created and their priority. The blocks of data from the open file are placed on a data queue. An X.25 or Ethernet LAN connection to a remote processor is then established. If the connection is successfully established, the AFT system starts transferring the data blocks. The transfer of each block is acknowledged by the remote processor using file transfer protocol (FTP). When an end of file (EOF) marker is reached, the DIRP file is closed and EOF protocol is sent to the remote processor. The next file in the directory is then selected and the process is repeated. If a problem occurs on the link or at the remote processor during the transfer period, the partial file

transfer (PFT) mechanism of the AFT system automatically resumes the file transfer from where the disruption occurred.

DIRP tables

The DIRP utility tables ensure the proper management of data and recording resources.

There are three DIRP tables:

- DIRPPOOL
- DIRPSSYS
- DIRPHOLD

The DIRPPOOL table lists the pools of recording devices allocated to each contributing subsystem. The DIRP utility can manage a maximum of 64 pools, each with a maximum of 24 recording volumes.

The DIRPSSYS table defines the operating parameters of each contributing subsystem. The DIRP utility can manage up to 24 subsystems.

The DIRPHOLD table serves as a directory for all closed files that require transmission. This table is used only in conjunction with data transferral or with the semiautomatic disk-to-tape copy utility DIRPAUTO.

A complete description of the DIRP utility control tables is contained in *Device Independent Recording Package Translations Guide*, 297-1001-356.

Other subsystems

In addition to the three main subsystems (AMA, OM, JF), other contributing subsystems may be datafilled. These subsystems include those that are associated with integrated business network (IBN) customer groups using the station message detail recording (SMDR) feature. Refer to *Meridian Digital Centrex (MDC) Translations Guide*, 297-2001-350, for information on IBN and SMDR.

DIRP101 log reports

DIRP101 log reports are produced when a condition prevents the normal operation of the DIRP utility. Refer to *Device Independent Recording Package Trouble Locating and Clearing Procedures*, 297-1001-573, for more information on DIRP101 logs.

DIRP101 logs are also referenced or described in the following NTPs:

- *Device Independent Recording Package Administration Guide*, 297-1001-345
- *Device Independent Recording Package Alarm Clearing Procedures*, 297-1001-571
- *Device Independent Recording Package Routine Maintenance Procedures*, 297-1001-572
- *Device Independent Recording Package Recovery Procedures*, 297-1001-574
- *Log Report Manual*, 297-1001-510

DIRP-related hardware

The DIRP utility shares hardware with other DMS systems and subsystems; no hardware is dedicated solely to the DIRP utility.

This chapter describes the following hardware related to the DIRP utility:

- MAP
- TAPE
- TAPEX
- DPP
- DISK

MAP

The MAP (maintenance and administration position) is a group of components that provide a user interface between operating company personnel and the DMS-100 Family systems. A MAP consists of a visual display unit and keyboard, a voice communication module, test facilities, and MAP furniture. All interaction between the DIRP utility and operating company personnel is done at the input/output device (IOD) level of the MAP.

TAPE

TAPE is a magnetic tape drive used to record AMA and OM data. Magnetic tape drives are located on the IOC shelf.

Internal contents of tape file

Inside the tape file are individual blocks of data that are separated by interrecord gaps (IRG). The IRG indicates the amount of blank space between successive blocks on the tape. This blank space is used by the tape drive to accelerate the tape when searching for the next block.

Identification of tape contents

The DIRP utility identifies the contents of a tape by file name, tape identification name, and volume name. The file name identifies the actual data file stored on the tape. Operating company personnel can assign a name to a file on a tape volume by defining the file name in the FILENAME

field of table DIRPSSYS. If a file name is not specified by the user in table DIRPSSYS, a system-generated name is assigned to the file.

In the DIRP environment, the TAPE drive has the following characteristics:

- one volume per tape
- one file per volume
- 28 Mbytes per tape

TAPEX

TAPEX is a magnetic tape drive, similar to TAPE except that it may contain multiple files in a volume. On a TAPEX volume, label and header information is placed first. Data files are recorded, then, after the files are closed, separated by a tape mark. The end of the tape is indicated by an end-of-tape (EOT) marker.

In the DIRP environment, the TAPEX drive has the following characteristics:

- one volume per tape
- multiple files per volume
- 28 Mbytes per tape

DPP

A DPP is a peripheral module that accepts DMS data, formats it if necessary, and stores it on disk. Upon request, the DPP module retrieves data and sends it to the host office collector. In the DIRP environment, the DPP device emulates two magnetic tape drives.

The DIRP utility uses the DPP device for AMA data storage and automatic recovery of volumes during a new BCS insertion, activity switch, or restart reload.

Because DMS Family data stream interfaces appear as magnetic tape drives, DPP devices are mounted in the DIRP environment as tape volumes for recording. During normal conditions, the DIRP utility directs the AMA data through the magnetic tape port to the DPP data stream interface cards. As the DPP device receives AMA data, it formats the data when required and stores the data on its own internal hard disks.

Although the DPP device emulates tape, the DPP device takes less real time to complete tape-oriented activities such as CLOSE, DEMOUNT, MOUNT, and FORMAT.

In the DIRP environment, the DPP device has the following characteristics:

- multiple volumes per DPP device
- multiple files per volume

- 300 Mbytes per DPP device

DISK

DISK is a DDU. DISK can have many files open simultaneously for recording. Because it has multiple volumes, DISK can also handle the recording of data from more than one subsystem.

The DIRP utility supports the following types of disks:

- IOC disk
- SLM disk

Input/output controller disk

IOC disks are located on the IOC shelf. Each IOC shelf has one or more disk drives.

In the DIRP environment, an IOC disk has the following characteristics:

- multiple volumes per disk
- multiple files per volume
- up to 220 Mbytes per disk

System load module disk

The feature package NTXJ44AA (SLM File System) allows the DIRP utility to record DMS subsystem data on an SLM disk.

The SLM disk has the following capabilities and limitations:

- Only the SLM disk is available to the DIRP utility. The DIRP utility cannot record data on the SLM cartridge tape drive.
- Mixing IOC volumes with SLM volumes for storing the same subsystem data causes performance fluctuations.
- To make DIRP operations on the IOC disk completely compatible with DIRP operations on the SLM disk, the maximum volume size is limited to 64 Mbytes.
- Both regular recording and parallel recording through the DIRP utility can be performed on the SLM disk.

The SLM is part of the DMS SuperNode platform. SLM disks are faster and have greater storage capacity than IOC disks. Consequently, SLM disks can replace IOC disks as the principal DIRP recording device in DMS SuperNode. SLM disks are connected to each of the duplicate central processing units in the computing module.

If SLM disks are used as the only regular and parallel recording devices for a subsystem, the active file and parallel files will eventually be located on the same SLM disk after rotation. The reason for this is that there are only two SLM units per DMS SuperNode. This may decrease the DIRP utility’s

fault tolerance because both the parallel file and the active file are affected if the SLM disk fails.

In the DIRP environment, an SLM disk has the following characteristics:

- multiple volumes per disk
- multiple files per volume
- 600 Mbytes per disk

DIRP software

This chapter describes the DIRP utility's software requirements and the additional features that are available.

Software requirements

The following feature packages are required for the DIRP utility to function.

Table 3-1xxx
DIRP base software

Package number	Title
NTX000AA	Bilge
NTX001AA	Common Basic

NTX000AA

The Bilge feature package is the basic start-up software that is required by a DMS-100 Family switch.

NTX001AA

The Common Basic feature package is the basic operating software for all DMS-100 Family switches. The DIRP utility is part of the Common Basic feature package. The Common Basic feature package also contains the AMA, JF, and OM subsystems.

Additional features

The following feature packages are available to support additional capabilities.

Table 3-2xxx
Additional DIRP features available

Package number	Title
NTXJ44AA	SLM File System
NTXJ94AA	Mandatory DIRP Parallel Recording
NTXP14AA	DIRP Parallel Storage Size Increase
NTX243AA	Automatic Message Accounting Teleprocessing System (AMATPS)

NTXJ44AA

The SLM File System feature package enables the DIRP utility to invoke enhanced SLM file system functions to use the SLM disk for recording DMS subsystem data. This feature applies only to DMS SuperNode switches.

NTXJ94AA

The Mandatory DIRP Parallel Recording feature package enhances the level of AMA recording security by ensuring continuity in the parallel recording of AMA data. The DIRP utility automatically opens parallel AMA files and provides a recurring audible alarm if the parallel AMA file cannot be opened.

NTXP14AA

The DIRP Parallel Storage Size Increase feature package increases the amount of recording medium that is available for parallel data. The DIRP utility user interface commands are modified to assist operating company personnel in initiating and restoring parallel recordings and in manipulating parallel recording volumes.

NTX243AA

The Automatic Message Accounting Teleprocessing System (AMATPS) feature package implements the distributed processing peripheral in the DMS-100 and supports its application in the AMATPS system for offices using Bellcore AMA format.

Finding DIRP information

This chapter lists and describes administration, maintenance, planning and engineering, and translations documentation that is related to the DIRP utility.

Administration

Administration documents are used for establishing and ensuring the accuracy of the DIRP database, and for monitoring service performance. These documents provide procedures to gather and validate system operational measurement data, to evaluate system performance and capacity, and to ensure effective use and operation of the DIRP utility.

Table 4-1xxx
Administration documents

Document	Title
297-1001-345	*Device Independent Recording Package Administration Guide*
297-1001-510	*Log Report Manual*
297-1001-814	*Operational Measurements Reference Manual*

The *Device Independent Recording Package Administration Guide*, 297-1001-345, describes the DIRP utility and provides information on its administration.

The *Log Report Manual*, 297-1001-510, provides information necessary to understand and use log reports, including DIRP101 log reports, generated by the DMS-100 Family of switches.

Operational Measurements Reference Manual, 297-1001-814, contains descriptions of DMS-100 OM groups. OM groups provide information on switch performance and activity.

Maintenance

Maintenance documents are used to keep the DIRP utility operating normally or to restore it to normal operation if it fails. These documents contain the procedures and descriptive information required to keep DIRP software and its related hardware working fully, and include operation and maintenance strategies, procedures and data for preventive and corrective maintenance, and methods for testing and validating the performance of the DIRP utility.

Table 4-2xxx
Maintenance documents

Document	Title
297-1001-571	*Device Independent Recording Package Alarm Clearing Procedures*
297-1001-572	*Device Independent Recording Package Routine Maintenance Procedures*
297-1001-573	*Device Independent Recording Package Trouble Locating and Clearing Procedures*
297-1001-574	*Device Independent Recording Package Recovery Procedures*
297-1001-110	*Maintenance and Administration Position (MAP)*
297-1001-118	*Magnetic Tape Reference Manual*
297-1001-311	*Distributed Processing Peripheral (DPP) User Guide*
297-1001-509	*Command Reference Manual*
297-1001-510	*Log Report Manual*
297-1001-526	*Disk Maintenance Subsystem Reference Manual*
297-1001-529	*Distributed Processing Peripheral Maintenance Reference Manual*
297-1001-801	*Feature Description Manual*
297-1001-805	*Hardware Description Circuit Cards Reference Manual*
297-5001-504	*System Load Module Maintenance Performance Oriented Practice*
297-5001-523	*System Load Module Maintenance Reference Manual*

Device Independent Recording Package Alarm Clearing Procedures, 297-1001-571, describes the alarm clearing indicators and procedures for the DIRP utility.

Device Independent Recording Package Routine Maintenance Procedures, 297-1001-572, describes the scheduled and unscheduled routine procedures used to maintain DIRP recording devices.

Device Independent Recording Package Trouble Locating and Clearing Procedures, 291-1001-573, identifies the DIRP utility trouble indicators requiring clearing procedures.

Device Independent Recording Package Recovery Procedures, 297-1001-574, identifies the tasks that are required to recover data lost during a restart of the DIRP utility.

The *Maintenance and Administration Position (MAP)*, 297-1001-110, describes the basic MAP components, which include a visual display unit with keyboard, a voice communications module, and testing facilities.

The *Magnetic Tape Reference Manual*, 297-1001-118, describes the characteristics of magnetic tape formats that are used with the DMS-100 Family of switches.

The *Distributed Processing Peripheral (DPP) User Guide*, 297-1001-311, describes the user interface, operation, and administration of the device processing peripheral.

The *Command Reference Manual*, 297-1001-509, contains DMS support operating system commands for operating company personnel familiar with the DMS-100 command interpreter.

The *Log Report Manual*, 297-1001-510, provides information necessary to understand and use log reports, including DIRP101 log reports, generated by the DMS-100 Family of switches.

The *Disk Maintenance Subsystem Reference Manual*, 297-1001-526, describes the disk maintenance subsystem and is a complete reference guide for users of the DDU. It includes a brief overview of the hardware components of the disk drive unit and a description of how information is recorded on disk.

The *Distributed Processing Peripheral Maintenance Reference Manual*, 297-1001-529, provides maintenance procedures for the distributed processing peripheral.

The *Feature Description Manual*, 297-1001-801, provides feature information for the DMS-100. Feature information is intended to help operating company personnel prepare for the insertion of a new BCS load and understand elements of the software.

The *Hardware Description Circuit Cards Reference Manual*, 297-1001-805, contains descriptions of DMS-100 circuit cards. The cards described in this manual can be ordered by the customer as provisional items, with quantities based on the office’s size, traffic capacity requirements, or feature requirements, or as spare or replacement items.

The *System Load Module Maintenance Performance Oriented Practice*, 297-5001-504, contains performance-oriented trouble procedures for clearing SLM alarms in the input/output devices maintenance subsystem. It includes detailed procedures for replacing individual SLM cards.

The *System Load Module Maintenance Reference Manual*, 297-5001-523, explains the MAP displays and commands for the SLM in the input/output devices maintenance subsystems. It explains SLM alarms and status display fields, lists syntax for each command, and explains command parameters.

Planning and engineering

Planning and engineering documents are used for sizing and ordering the DIRP utility. These documents contain detailed equipment physical characteristics, compatibilities, limitations, test equipment needs, and ordering information. In some cases, these documents also provide detailed traffic descriptions, including engineering procedures and algorithms for an initial and a growth engineering job.

Table 4-3xxx
Planning and engineering documents

Document	Title
297-1001-175	*Device Independent Recording Package Planning and Engineering Guide*
297-1001-450	*Provisioning*
297-1001-455	*Office Parameters Reference Manual*
297-1001-801	*Feature Description Manual*

The *Device Independent Recording Package Planning and Engineering Guide*, 297-1001-175, provides a high-level description of the planning and engineering process that is associated with the DIRP utility in the DMS network. The information in this guide is intended to be used in conjunction with the information in *Provisioning*, 297-1001-450, to allow operating company personnel to understand the DIRP provisioning process fully.

Provisioning, 297-1001-450, describes the rules and guidelines for provisioning the DMS-100 Family switching machine, its components, and its features. A package of services and features, specified by the customer, is assembled by selecting types and quantities of hardware and software modules from a range of DMS-100 Family products.

Office Parameters Reference Manual, 297-1001-455, assists operating company personnel in preparing the office parameter data for the switching unit. The office parameter is stored in a series of data store look-up tables, which are used in conjunction with software programs and system circuits to

provide the switch with the proper parameters for the switch features. Each table is associated with an input form. When existing parameters are changed or new parameters are added, the existing input forms require revision.

The *Feature Description Manual*, 297-1001-801, provides feature information for the DMS-100 Family of switches. Feature information helps operating company personnel prepare for the insertion of a new BCS load and understand elements of the software.

Translations

Translations documents provide the instructions, procedures, and forms for the preparation and management of input data. These data include information about lines, trunks, service circuits, customer features, routing and charging characteristics, and equipment assignments, as well as miscellaneous office information such as traffic measurement schedules. Translations documents also provide information and instructions for creating, verifying, retrieving, and changing this data.

Table 4-4xxx
Translations reference documents

Document	Title
297-1001-356	*Device Independent Recording Package Translations Guide*
297-1001-451	*Common Customer Data Schema*
297-1001-455	*Office Parameters Reference Manual*
297-1001-801	*Feature Description Manual*

The *Device Independent Recording Package Translations Guide*, 297-1001-356, provides information about translation requirements for DIRP functionality on the DMS-100 Family of switches.

Common Customer Data Schema, 297-1001-451, assists the operating company in preparing the office-dependent data for the switching unit. The office-dependent data is stored in a series of data store look-up tables, which are used in conjunction with software programs and circuits to advance the call through the various stages of call processing. This document describes each table according to its uses, the names and meanings of its fields, and valid entries for each field. It does not provide translation information, call processing sequence, or complete feature implementation datafill for the DMS Family of switches.

Office Parameters Reference Manual, 297-1001-455, assists operating company personnel in preparing the office parameter data for the switch.

The office parameter data is stored in a series of data store look-up tables, which are used in conjunction with software programs and system circuits to provide the switch with the proper parameters for the switch features. Each table is associated with an input form. When existing parameters are changed or new parameters are added, the existing input forms require revision.

The *Feature Description Manual*, 297-1001-801, provides feature information for the DMS-100 Family of switches. Feature information helps operating company personnel prepare for the insertion of a new BCS load and understand elements of the software.

List of terms

AMA

Automatic message accounting

AMAT

Automatic message accounting transmitter

AMATPS

Automatic message accounting teleprocessing system

Audit

The process of verifying the integrity of the system and attempting to correct errors when detected.

Automatic message accounting (AMA)

An automatic recording system that documents all the necessary billing data of subscriber-dialed long distance calls.

Automatic message accounting teleprocessing system (AMATPS)

A system that is used to manage subscriber billing data. The system consists of a data-collecting computer that polls central offices for automatic message accounting data.

Automatic message accounting transmitter (AMAT)

A subsystem of the automatic message accounting teleprocessing system that, on request, transmits automatic message accounting data to the collector in the central office.

Bellcore

Bell Communications Research

DDU

Disk drive unit

Disk drive unit (DDU)

A disk drive and a power-converter card installed in an input/output equipment frame.

Distributed processing peripheral (DPP)

A peripheral module that accepts data from the DMS-100, formats the data if necessary, and stores it on a disk. Upon request, the DPP retrieves and sends data to the host office collector.

DPP

Distributed processing peripheral

End-of-tape (EOT)

A reflective strip located 25 ft from the end of the permissible recording area on magnetic tape data recordings. The strip generates an EOT signal, beyond which data should not be recorded. *See also with* beginning-of-tape.

EOT

End-of-tape

Error

In telephony, a detectable trouble condition that cannot be reproduced at will by the system or by external means; a transient or intermittent fault that does not yield consistent diagnostic test results.

Field

Vertical column of a table.

HOC

Host office collector

Host office collector (HOC)

A data center that collects automatic message accounting data from central offices within a given region. The HOC collects the data onto tapes and passes the information to the revenue accounting office for the production of subscriber bills.

IBN

Integrated business network

Input/output (I/O)

Refers to a device or medium that is used to achieve a bi-directional exchange of data. Data exchange in the DMS-100 Family system is performed in accordance with the input/output message system.

Input/output controller (IOC)

An equipment shelf that provides an interface between up to 36 input/output devices and the central message controller. The IOC contains a peripheral processor that independently performs local tasks, thus relieving the load on the central processing unit.

Input/output device (IOD)

A hardware device that interprets input and formats output for human users or remote computers.

Integrated Business Network (IBN)

Now known as Meridian Digital Centrex. A special DMS business services package that uses the data-handling capabilities of a DMS-100 Family office to provide a centralized telephone exchange service. Many optional features are also available.

Interrecord gap (IRG)

The space between two consecutive blocks on a data medium. An area on a data medium to indicate the end of a block or physical record.

I/O

Input/output

IOC

Input/output controller

IOC shelf

A hardware shelf that provides an interface between up to 36 input/output devices and the central message controller. *See* input/output controller.

IOD

Input/output device

IRG

Interrecord gap

JF

Journal file

Journal file (JF)

A facility that preserves, on a recording device, changes made to the data tables of the DMS-100 Family systems. The JF provides a means of restoring the tables should it be necessary to reload office software from a backup image.

Magnetic tape drive (MTD)

In DMS, a device used to record DMS-100 Family data. An MTD may be mounted on either a magnetic tape center frame or an input/output equipment frame.

Maintenance and administration position (MAP)

A group of components that provide a user interface between operating company personnel and the DMS-100 Family systems. A MAP consists of a visual display unit and keyboard, a voice communications module, test facilities, and MAP furniture.

Man-machine interface (MMI)

See user interface.

MAP

Maintenance and administration position

MMI

Man-machine interface. *See* user interface.

MTD

Magnetic tape drive

OM

Operational measurements

Operational measurements (OM)

The hardware and software resources of the DMS-100 Family systems that control the collection and display of measurements taken on an operating system. OM organize the measurement data and manage their transfer to displays and records on which maintenance, traffic, accounting, and provisioning decisions are based.

Reload restart

Refers to the setting of software pointers in a program to simulate actual reload of software into DMS-100 Family switches. Office configuration and translation data are retained, but all dynamic data is cleared.

Remote data polling system (XFER)

A system that permits an operating company to transfer information concerning the operation of a DMS-100 Family office to its data processing center.

Restart

The re-establishment of the process of executing a routine after a program or data error or machine malfunction. A restart usually involves returning to checkpoints placed at appropriate intervals such that, in the event of a failure, a job can be resumed without starting at the beginning of the run. A restart has a severity associated with it that reflects the importance of the resources being reset. *See also* cold restart; warm restart.

Shelf

A container for drawers, cards, or both.

SLM

System load module

SMDR system

Station message detail recording system

SOS

Support operating system

Station message detail recording (SMDR) system

In Meridian Digital Centrex, a system that provides recording facilities for the details of billable and nonbillable calls for each Meridian Digital Centrex customer group.

Subscriber

An individual user of a telephone station set that is connected to a DMS switch.

Support operating system (SOS)

The software that sets up the environment for loading and executing the application software in the DMS-100 Family system. SOS includes the nucleus, file system, command interpreter, and loader.

System load module (SLM)

A mass-storage system in DMS SuperNode that is used to store office images. From the SLM, new loads or stored images can be booted into the computing module.

Table

Two-dimensional entities in which the data associated with the hardware and software systems of the DMS-100 Family is stored.

Tape unit

See magnetic tape unit.

User interface

The series of commands and responses that are used by operating company personnel to communicate with the DMS-100 Family system machines. User interface is achieved through the maintenance and administration position and other input/output devices. Used to be known as man-machine interface.

Utility

In DMS software, a module that provides resources that it can allocate on request and recover when filed. It also controls access to data structure.

VDU

Visual display unit

Visual display unit (VDU)

An electronic output device that presents data to a terminal user in the form of a television picture. In the DMS Family of switches, the VDU is one of the components of the maintenance and administration position, and, along with a keyboard, provides the main user interface in the DMS-100 Family systems.

Warm restart

An initialization phase during which temporary storage is deallocated and cleared. Transient calls are dropped while calls in the talking state continue. *See also* cold restart.

XFER

Remote data polling system

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Product Guide

Information is subject to change without notice. Northern Telecom reserves the right to make changes in design or components as progress in engineering and manufacturing may warrant.

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